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RESEARCH ARTICLE

ISOLATION OF *ACINETOBACTER SPECIES* IN AN INTENSIVE CARE UNIT AND ITS ANTIBIOTIC SENSITIVITY PATTERN IN A TERTIARY CARE HOSPITAL, PATNA, BIHAR

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ABSTRACT

Background: Recently, *Acinetobacter* has emerged as significant hospital pathogen, notoriously known to acquire antibiotic resistance to most of the commonly prescribed antimicrobials. Many risk factors are associated with *Acinetobacter* infections, especially in patients in intensive care unit (ICU). The aim of this study was to isolate *Acinetobacter species* from clinical specimens and its antimicrobial susceptibility pattern.

Material and Methods: Identification of *Acinetobacter spp.* was done by the battery of biochemical tests and its antimicrobial sensitivity was done according to Clinical and Laboratory Standards Institute guidelines (CLSI).

Results: Among the 158 isolates, 25 *Acinetobacter strains* (15.8%) were isolated mainly from the respiratory samples 24(96%) and only one (4%) isolate was from pus. Majority of *Acinetobacter strains* was isolated from male patients 19 (76%). Among the *Acinetobacter spp.* isolated, 44% were sensitive to Imipenem, 32% for Amikacin, 20% for Ceftazidime, 12% for Gentamycin, 4% for Cotrimoxazole and Piperacillin-Tazobactam. All the isolates showed 100% resistance for Ampicillin and Cefazolin.

Conclusion: Nosocomial infection caused by *Acinetobacter spp.* was resistant to most antimicrobials have emerged, especially in ICU. Early identification and continued surveillance of prevalent organism will help in preventing the spread of *Acinetobacter* in hospital environment.

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INTRODUCTION

Acinetobacter spp. are Gram-negative Cocco-bacilli, strictly aerobic, non-motile, catalase positive, oxidase negative and lack pigmentation (Bergogne-Bérézin and Towner, 1996). They are ubiquitous free living saprophytes in soil and water (Riley, 2005). Up to 25% of healthy ambulatory adults exhibit cutaneous colonization by *Acinetobacter* and are the most common Gram-negative bacteria carried on the skin of hospital personnel (Allen and Hartman, 2000). They are usually opportunistic pathogens reported to cause a number of outbreaks of nosocomial infections such as septicemia, pneumonia, wound sepsis, endocarditis, meningitis, urinary tract infections and peritonitis (Koneman *et al*., 2006), but their predominant role is in ventilator associated pneumonia (VAP), in intensive care units (ICUs) (Bergogne-Bérézin and Towner, 1996). Predisposing factors for *Acinetobacter* infections include the presence of prosthesis, endotracheal intubation, intravenous (I.V.) catheters and prior antibiotic therapy in a seriously ill-patient in hospital (Allen and Hartman, 2000). Such infections are often extremely difficult to treat because of widespread resistance to the major groups of antibiotics and long-term survival of bacteria in the hospital environment (Bergogne-Bérézin and Towner, 1996). Resistance to all known antibiotics has now emerged in *Acinetobacter spp.* with the majority of strains still being susceptible to Carbapenems (Peleg *et al*., 2008). Multidrug-resistant (MDR) *Acinetobacter* infections are associated with increased time on mechanical ventilation, in the ICU and in the hospital. Treatment options are severely limited; carbapenems and colistin are the agents of choice. More research and greater emphasis on the prevention of health-care associated transmission of MDR *Acinetobacter* infection are essential (Maragakis and Perl, 2008; Clinical and Laboratory Standard Institute, 2008). This study aims to isolate *Acinetobacter* from various clinical specimens and to determine its antimicrobial sensitivity pattern in the medical Intensive Care Unit (ICU) and Coronary Care Unit (CCU) patients in IGIMS, Patna.

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MATERIALS AND METHODS

The present observational study was carried out in the clinical microbiological laboratory of Indira Gandhi Institute of Medical Sciences, Patna, Bihar from December 2011 to June 2013, after the approval of research and Ethics Committee, IGIMS, Patna. A total of 187 patients were studied in the described period from the patients admitted in the 8-bedded Medical Intensive Care Unit (MICU) and 6 bedded Coronary Care Unit (CCU). Clinical specimens like sputum, endotracheal aspirate, blood, pus and urine were collected by standard collection procedures. No specific exclusion criteria was considered. All specimens were inoculated on Blood agar and MacConkey agar and incubated aerobically at 37°C for 18-24 hrs. Colonies on blood agar were 0.5-2 mm in diameter, translucent to opaque, convex and entire. On Mac Conkey agar a faint pink tint was produced. Gram stain, catalase, and oxidase tests were performed. *Acinetobacter* are Gram-negative Coccobacilli, catalase positive and oxidase negative. Further identification of *Acenetobacter was done* by the battery of biochemical tests and its antimicrobial sensitivity was done according to Clinical and Antimicrobial susceptibility testing by modified Kirby Bauer method as per the Clinical and Laboratory Standards Institute guidelines. Antibiotics tested were Ampicillin(A), Cefazoline(CZ), Ceftazidime (CAZ), Cefipime (CPM), Amikacin (AK), Gentamicin (G), Cotrimoxazole (CO), Imipenem (IPM) and Piperacillin Tazobactam (PTZ).

RESULTS

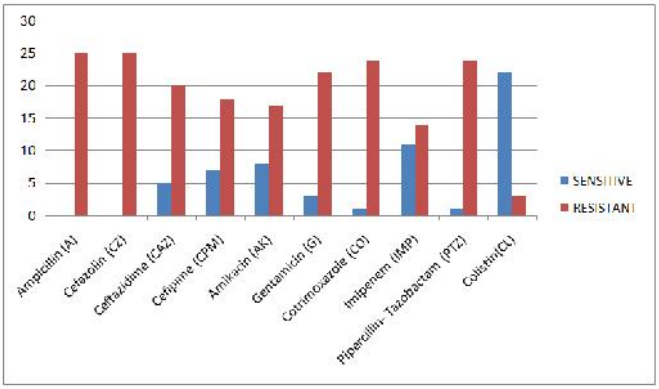
During our study period, total admissions to our ICU were 1380. Patients admitted for more than 48 h were 580. Among them 187 pts were suspected from whom 304 specimens like urine, respiratory samples, blood and pus were collected. 110 pts were identified to have hospital acquired infection during their stay in the ICU.

Table 1. Microbial profile of the isolates from different samples

Isolates	Number	Percentage
Escherichia coli	34	21.5%
Acinetobacter spp.	25	15.8%
Citrobacter spp.	19	12%
Klebsiella pnemoniae	12	7.6%
Pseudomonas aruginosa	10	6.3%
Coagulase negative Stapylococc spp.	7	4.5%
Staphylococcus aureus	6	3.9%
Proteus spp.	4	2.5%
Enterobacter spp.	1	0.6%
Enterococcus spp	1	0.6%
Streptococcus spp.	1	0.6
Yeast other than Candida albicans (YOCA)	30	19%
Candida albicans	8	5.1%

Table 2. Antibiotic sensitivity pattern of *Acinetobacter spp*. (No. 25)

Antibiotic disc	Sensitive No. (%)	Resistant No. (%)
Ampicillin (A)	0%	25(100%)
Cefazolin (CZ)	0%	25(100%)
Ceftazidime (CAZ)	5(20%)	20(80%)
Cefipime (CPM)	7(28%)	18(72%)
Amikacin (AK)	8(32%)	17(68%)
Gentamicin (G)	3(12%)	22(88%)
Cotrimoxazole (CO)	1(4%)	24(96%)
Imipenem (IMP)	11(44%)	14(56%)
Pipercillin- Tazobactam (PTZ)	1(4%)	24(96%)
Colistin (CL)	22(88%)	3(12%)



Among the 158 isolates, 25 *Acinetobacter strains* (15.8%) were isolated mainly from the respiratory samples 24(96%) and only one (4%) isolate was from pus. Majority of *Acinetobacter strains* was isolated from male patients 19 (76%).

DISCUSSION

Acinetobacter spp. is Gram-negative Coccobacilli that contribute profoundly to the burden of modern medicine. *Acinetobacter spp.* is the second most commonly isolated non-fermenter in human specimens after *Pseudomonas aeruginosa*. They rank fourth after *P. aeruginosa*, *Stapylococcus aureus* and *Klebsiella pneumonia* among the most frequent hospital acquired infectious agents (Shete *et al*., 2009). *Acinetobacter spp*. have emerged as a cause of ICUs infection. Multiresistant *Acinetobacter spp.* have become established as "alert" pathogens, particularly in ICUs and are associated with outbreaks of infection (13). In the present study, *Acinetobacter* infections were more common in males (54.20%) as compared with females. This may be due to the fact that the males report more frequently to the hospitals compared with females. Prashanth and Badrinath *et al*. (2006) reported the infections to be more common in males (58%) compared with females (42%). Joshi *et al*. (2006) reported 50.20% infection in males. In our study, a total number of 25 (15.8%) *Acinetobacter* strains were isolated from processed clinical specimen. Prashanth and Badrinath *et al*. (2006) reported 10% *Acinetobacter* infections in ICU. Patwardhan *et al*. (2008) isolated 13.23% *Acinetobacter* isolates. Our findings are comparable with Patwardhan *et al*. In study of Kaur, *et al*. (2016) respiratory samples showed *A. baumannii* (68.75%) as compared to non-respiratory samples. This study is in concordance with a study by Jaggi *et al*. (2012). Who reported isolation rate of *A. baumannii* in respiratory samples as 59.6%. In a study by Nahar *et al*. (2012) 100% resistance was recorded towards amoxicillin, ceftriaxone, cefuroxime and gentamicin. In our study *Acinetobacter* strains showed 100% resistance to Ampicillin and Cefazolin. Higher level of resistance was recorded was amikacin (68.4%) and Imipenem (66.7%) but lower level of resistance was shown in colistin (10.5%) (Clinical and Laboratory Standard Institute, 2008). Rahbar *et al*. (2010) also reported high level of resistance towards Piperacillin-tazobactum (90.9%), ceftriaxone (90.9%), ceftazidime (84.1%) and ciprofloxacin (90.9%). In an another study by Shakibaie *et al*. (2012), they found that many isolates of *Acinetobacter* were resistant to almost all antibiotics routinely used in the ICU of their hospital. In case of pan drug resistant Acinetobacter infections, alternative antibiotics available are colistin, polymixin B and tigecycline. Sinha *et al*. (2007) reported maximum sensitivity to meropenem (86.00%), CIP (36.00%), AK (33.00%), CPM (26.00%), CAZ (26.00%)

and maximum resistance was reported to PIP (90.00%) and CTX (87.00%). In our study, Colistin showed 88% sensitivity followed by imipenem (44%), amikacin (32%), cefipime (28%) and ceftazidime (20%). Increasing antimicrobial resistance leaves few therapeutic options for MDR *Acinetobacter* infection.

Conclusion

Acinetobacter are the "superbugs" of the modern hospital environment causing significant proportion of infections in specific patient populations, especially in critically ill patients in the ICU. Antibiotic resistance is attributed to production of extended spectrum beta-lactamase, MBL, loss of outer membrane proteins, efflux pumps and biofilm formation. Are there ways to control or limit the spread of these multiresistant strains? Is it still possible to treat. *Acinetobacter* infections? First, it is necessary to improve microbiological techniques for early and more accurate identification and laboratory vigilance to prevent inappropriate empirical treatment. Second, newer strategies for antibiotic use should be employed to reduce selection pressure, including more frequent rotation of antibiotic groups or sequential use of antibiotic classes. Continued awareness to maintain good housekeeping, control of the environment including equipment decontamination, strict attention to hand washing, isolation procedures and control of antibiotic usage, especially in high-risk areas, appear most likely measures to control the spread of *Acinetobacter spp*. in hospitals.

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